FTP TESTS (CONT.)

Date	Odometer	Lab	Fuel	THC GPM	CO GPM	NOx GPM	F.E MPG	Part. GPM	Freon Conc
7/24/91	10402	EPA2	MMT	0.321	2.386	0.522	22.4	0.006	None
7/25/91	10483	EPA2	MMT	0.335	2.526	0.532	22.5	0.007	None
7/26/91	10565	EPA2	MMT/FREON	0.368	2.472	0.578	22.5	0.012	30 ppm
7/27/91	10646	EPA2	MMT/FREON	0.397	2.806	0.610	22.5	0.040	250 ppm
7/28/91	10728	EPA2	MMT	0.334	2.513	0.559	22.3	0.006	None
7/29/91	10809	EPA2	MMT	0.337	3.292	0.559	22.2	0.006	None
EPA MMT		Mean		0.332	2.679	0.543	22.4	0.006	
		Standard Deviation		0.007	0.413	0.018	0.1	0.001	
EPA MMT/FREON		Mean		0.383	2.635	0.594	22.6	0.026	
		Standard Deviation		0.021	0.236	0.023	0.0	0.020	
7/31/91	10935	EPA2	Clear	0.346	3.000	0.499	22.4	0.005	None
8/1/91	11016	EPA2	Clear	0.347	3.220	0.551	22.3	0.004	None
EPA Clear		Mean		0.347	3.110	0.525	22.4	0.004	
		Standard Deviation		0.001	0.155	0.037	0.1	0.001	

NOTES:

FTP TESTS DATED 7/1 AND 7/2/91 WERE CONDUCTED WITH THE FUEL CONTAINED IN THE VEHICLE TANK AS SHIPPED FROM MVEL.

TESTS DATED 7/8, 7/9 AND 7/10/91 WERE CONDUCTED WITH EPA CERTIFICATION FUEL WITH MMT ADDED BY ETHYL.

ALL TESTS LISTED IN RUN ORDER

EPA2 IS THE SECOND SET OF TESTS AT EPA RUN FOR THIS PROGRAM

HIGHWAY TESTS

Date	Odometer	Lab	Fuel	THC GPM	CO GPM	NOx GPM	F.E. MPG	Part. GPM	Freon Conc
6/13/91	8649	EPA	MMT/FREON	0.049	0.858	0.144	33.9	0.041	Unknown
6/14/91	8732	EPA	MMT/FREON	0.043	0.582	0.015	33.9	0.026	Unknown
6/18/91	9285	EPA	MMT/FREON	0.036	0.472	0.097	35.3	0.065	Unknown
6/19/91		EPA	MMT/FREON	0.040	0.693	0.126	34.5	0.089	Unknown
EPA MMT/FREON		Mean		0.042	0.651	0.095	34.4	0.055	
		Standard Deviation		0.005	0.165	0.057	0.7	0.028	
7/3/91		SwRI	MMT	0.05	0.80	0.12	33.8	0.016	None
7/8/91		SwRI	MMT	0.04	0.78	0.13	33.8	0.006	None
7/9/91		SwRI	MMT	0.04	0.71	0.13	34.1	0.003	None
SwRI MMT		Mean		0.04	0.76	0.13	33.9	0.008	
		Standard Deviation		0.01	0.05	0.01	0.2	0.007	
7/10/91		SwRI	Clear	0.04	0.64	0.15	34.2	0.002	None
7/11/91		SwRI	Clear	0.04	0.69	0.12	35.7	0.001	None
SwRI Clear		Mean		0.04	0.67	0.14	35.0	0.002	
		Standard Deviation		0.00	0.04	0.02	1.1	0.001	
7/24/91	10413	EPA2	MMT	0.026	0.326	0.130	35.3	0.017	None
7/25/91	10491	EPA2	MMT	0.033	0.500	0.112	34.0	0.015	None
7/26/91	10576	EPA2	MMT/FREON	0.034	0.500	0.138	35.1	0.031	30 ppm
7/27/91	10657	EPA2	MMT/FREON	0.033	0.483	0.129	34.8	0.060	250 ppm
7/28/91	10739	EPA2	MMT	0.029	0.467	0.075	35.1	0.018	None
7/29/91	10820	EPA2	MMT	0.032	0.527	0.126	34.9	0.009	None
EPA MMT		Mean		0.030	0.453	0.117	34.8	0.015	
		Standard Deviation		0.003	0.089	0.025	0.6	0.004	
EPA MMT/FREON		Mean		0.034	0.492	0.134	35.0	0.046	
		Standard Deviation		0.001	0.012	0.008	0.2	0.021	
7/31/91	10946	EPA2	Clear	0.025	0.398	0.101	35.2	0.003	None
8/1/91	11027	EPA2	Clear	0.027	0.417	0.123	35.3	0.002	None
EPA Clear		Mean		0.026	0.408	0.112	35.3	0.002	
		Standard Deviation		0.001	0.013	0.016	0.1	0.001	

NYCC TESTS

Date	Odometer	Lab	Fuel	THC GPM	CO GPM	NOx GPM	F.E. MPG	Part. GPM	Freon Conc
6/13/91	8710	EPA	MMT/FREON	0.524	2.857	1.164	11.1	0.026	Unknown
6/14/91	8792	EPA	MMT/FREON	0.371	1.999	1.362	12.5	0.009	Unknown
6/18/91	9348	EPA	MMT/FREON	0.530	2.287	1.302	12.7	0.036	Unknown
6/19/91	9419	EPA	MMT/FREON	0.941	3.214	1.641	11.4	0.049	Unknown
EPA MMT/FREON		Mean		0.592	2.589	1.367	11.9	0.030	
		Standard Deviation		0.244	0.548	0.200	0.8	0.017	
7/3/91		SwRI	MMT	0.37	3.84	1.45	11.1	0.012	None
7/8/91		SwRI	MMT	0.39	5.10	1.24	11.3	0.011	None
7/9/91		SwRI	MMT	0.44	4.85	1.48	11.0	0.004	None
SwRI MMT		Mean		0.40	4.60	1.46	11.1	0.009	
		Standard Deviation		0.04	0.67	0.12	0.2	0.004	
7/10/91		SwRI	Clear	0.40	4.68	1.32	11.3	0.004	None
7/11/91		SwRI	Clear	0.36	4.24	1.31	11.7	0.003	None
SwRI Clear		Mean		0.38	4.46	1.32	11.5	0.004	
		Standard Deviation		0.03	0.31	0.01	0.3	0.001	
7/24/91	10473	EPA2	MMT	0.29	2.59	1.04	11.5	0.014	None
7/25/91	10555	EPA2	MMT	0.30	2.62	0.98	11.5	0.014	None
7/26/91	10636	EPA2	MMT/FREON	0.44	2.87	1.77	11.5	0.017	30 ppm
7/27/91	10718	EPA2	MMT/FREON	0.63	2.81	1.33	11.6	0.032	250 ppm
7/28/91	10799	EPA2	MMT	0.29	2.13	0.84	11.4	0.010	None
7/29/91	10881	EPA2	MMT	0.29	3.48	1.55	11.5	0.016	None
EPA MMT		Mean		0.291	2.705	1.103	11.5	0.014	
		Standard Deviation		0.004	0.586	0.310	0.1	0.003	
EPA MMT/FREON		Mean		0.534	2.535	1.550	11.6	0.028	
		Standard Deviation		0.137	0.042	0.306	0.1	0.011	
7/31/91	11007	EPA2	Clear	0.276	2.157	1.617	11.6	0.016	None
8/1/91	11088	EPA2	Clear	0.528	7.158	1.145	11.9	0.014	None
EPA Clear		Mean		0.402	4.658	1.381	11.8	0.015	
		Standard Deviation		0.178	3.536	0.334	0.2	0.001	

Reply to M. Davis Comment Regarding
Uncertainty Factor of 3 for Increased Exposure
Public Hearing Transcript, p. 86 AND 87

The Roels et al.[1] paper cited by EPA as the basis for determining the R_fC for manganese states that production has increased over the years and suggests that exposures may have increased.

> "No monitoring data were available to characterize the past pollution of the work environment by manganese. It should however be pointed out that the Mn plant started production in 1964 and that the production processes and the different halls have not subsequently undergone environmentally significant changes." (Reference 1, p. 309.)

This statement suggests that the production increase was accomplished without changes in the production areas. This leads to the conclusion that:

> "The current average exposure of 1 mg Mn/m^3 is most likely an overestimation for the exposure intensity in the past, since the production capacity gradually increased over the last 15 years." (Reference 1, p. 324.)

In addition, the authors state:

> "However, in view of the increased manganese production over the last 15 years, it is possible that the average level of exposure to Mn dust was less than 1 Mg/m^3 in the past." (Reference 1, p. 322.)

It should be noted, moreover, that a comparison paper[2] states that significant changes occurred in production areas such that increased production would not lead to increased exposure.

> "It should be pointed out that this plant started production in 1964 and that the initial production process and the various buildings are still in use, although significant additions have been made to them." (Reference 2, p. 299.)

This statement implies that production was increased by increasing production areas, not pushing higher production through the same facilities. In fact, this is the way production was increased at the plant in question. Both the professor in whose laboratory the researchers worked, Dr. Lauwerys, and the plant management, have indicated that exposures have not increased as production increased because of these additional production areas.[3]

It is a generally accepted tenant in industrial hygiene practice that a production increase does not necessarily mean increases in exposures to chemicals. For instance, increasing production by adding additional shifts may actually result in lowered exposures because continually operating processes tend to have lower emissions than intermittent processes.[4]

The EPA's decision to include an uncertainty factor of three in derivation of the R_fC for manganese to account for potentially higher manganese exposures at the plant in the past was in appropriate. Without this uncertainty factor, the R_fC for manganese would be 1.2 ug/m^3, not 0.4 ug/m^3.

References:

1. Roels, H. et al., Epidemiological Survey Among Workers Exposed to Manganese, Effects on Lung, Central Nervous System, and Some Biological Indices, Am. J. Ind. Hlth., 11:307-327 (1987).

2. Roels, H. et al., Relationship Between External and Internal Parameters of Exposure to Manganese in Workers from a Manganese Oxide and Salt Producing Plant, Am. J. Ind. Hlth., 11:297-305 (1987).

3. Ethyl Waiver Application for HiTEC 3000, July 12, 1991, Appendix 13, Attachment 1.

4. Fundamentals of Industrial Hygiene, J. B. Olishifski and F. E. McElroy, eds., National Safety Council, Chicago (1971).